STYLE GUIDE FOR THE DEVELOPMENT OF COMPETENCY-BASED LEARNING MATERIALS

Second Edition
1989

Prepared by the
Centre for Curriculum and Professional Development

for the
Province of British Columbia
Ministry of Advanced Education, Training and Technology

90-03830/

Canadian Cataloguing in Publication Data

Main entry under title:
Style guide for the development of competency based learning materials

Cover title.
Originally published: Style guide for the development of TRAC learning materials. 1985.
Includes bibliographical references.
ISBN 0-7726-1045-2

1. Technical writing. 2. Authorship - Style manuals. I. Centre for Curriculum and Professional Development. II. British Columbia. Ministry of Advanced Education, Training and Technology. III. Title: Style guide for the development of TRAC learning materials.

T11.S79 1989 808.0666 C90-092005-X

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Contents

Purpose of the Style Guide 2

The development process 3

Writing guidelines

General suggestions 9
Diction, spelling and punctuation 12
Specific terms (TRAC and Apprenticeship programs) .. 13
Metric and imperial usage 15
Glossary of behavioural terms 18
Copyright 20
Test item construction 23
Instructor guides 27

Production guidelines

General suggestions 28
Symbols 29
Page design and makeup 33
Graphics and photographs 35
Camera-ready copy 35

Resources

Print resources 36
Audio-visual resources 37
PEMC procedures 38

Additional resources 40

Appendix A-1

Purpose of the style guide

This Style Guide provides guidelines for the development of standarized print resources for provincial training programs. The first edition of the guide, Style Guide for the Development of TRAC Learning Materials, was produced in 1985 specifically to assist writers, editors, and technicians in creating learning packages for the TRAC (Training Access) Program. Since that time, the guide has undergone technical as well as other changes in order to make it applicable to a broader range of provincial vocational, pre-apprenticeship and apprenticeship programs.

These guidelines are the product of an on-going process of meeting and discussion among the contractors and the curriculum development coordinators in the Centre for Curriculum and Professional Development. Those directions in the Style Guide that are not appropriate for a specific project may be altered after consultation with and approval of the designated curriculum development coordinator. As a result of this kind of interaction, future editions of the Style Guide will include revisions giving guidelines and procedures for the development of an increasing variety of provincial programs.

This edition of the Style Guide is the latest step towards the long-term goal of having a single manual that contains guidelines applicable to any competency-based resource under development.

The development process

The process for developing competency-based learning materials has evolved over time as suggestions from the field have been incorporated into the original process.

In general, competency-based education places the emphasis on the learner meeting specific behavioural objectives to a set standard. Underlying the competency-based approach is a shift from the traditional concern with what individuals know, to what they can competently do as the result of training. This is a goal-oriented, performance-based approach for teaching practical, job related skills.

Provincially funded competency-based curriculum is typically produced following a set procedure. First, the DACUM (an acronym for Designing a Curriculum) approach is used to establish general areas of required competence. The DACUM is a multi-step procedure that starts with a job analysis to produce a competency profile, then establishes objectives to reflect the skills listed on the profile, and finally designs or adapts a program of instruction which will meet these objectives.

The competency profile consists of very general objectives, sometimes called lines or general areas of competence. These are further broken down into more specific and detailed objectives that are often called competencies. The competency profile in Figure 1 is typical of those developed for TRAC and Apprenticeship programs.

The process then moves to the development of learning tasks, which break down the competencies into narrowly focussed sub-skills to form the program outline, a sample of which is shown in Figure 2.

TRAC Automotive Parts Specialty Competency Profile

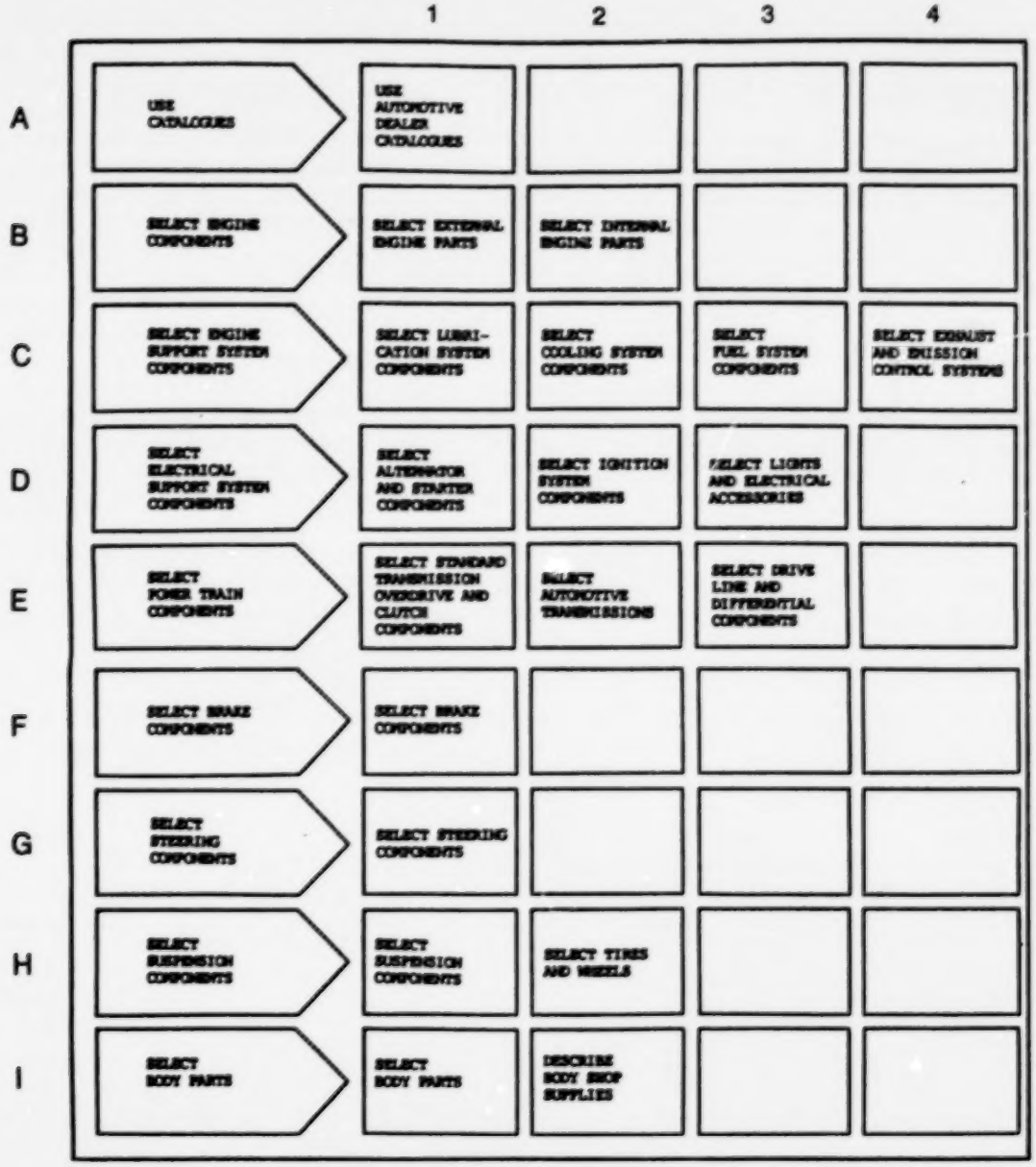


Figure 1 Competency profile

Line D:Select Electrical Support System Components

D-1 Select Alternator and Starter Components

Learning Tasks

1. Describe alternators
2. Describe starters

Practical Competencies

*1. Select alternator and starter components

Written Competency

Select alternator and starter components

D-2 Select Ignition System Components

Learning Tasks

1. Describe conventional ignition system components
2. Describe electronic ignition system components

Practical Competencies

*1. Select ignition system components

Written Competency

Select ignition system components

*Practical Competency must be obtained from instructor.

Figure 2 Program outline

From here, the process is taken up by a "Blueprint" Committee established by the curriculum funding agency. This committee is usually composed of instructors and industry representatives, contracting personnel and funding agency representatives. The committee builds on the program outline to produce a detailed "blueprint" that is used by the contractor to create the instructional packages. A page from a typical blueprint document is shown in Figure 3.

Content experts then work with writers and/or editors from the contracting agency to produce student learning guides and, in most cases, an accompanying instructor guide.

When the contractor has completed a draft of the materials, a Learning Guide Review Committee, usually composed of instructors, contracting personnel and representatives from the Centre for Curriculum and Professional Development, is brought together to give feedback, suggest changes and to generally evaluate the materials. Depending on the size of the project, there may be one or several review meetings.

After the review meeting(s) the contractor revises the materials to reflect the suggested modifications and additions, and then submits camera-ready copies to the Centre of Curriculum and Professional Development who arranges for their publication and distribution. Very often the contract also includes the development of an instructor guide to accompany the student materials.

Heavy Duty Mechanics Apprenticeship Blueprint

COMPETENCY K-2

TRAC: HD B-1
MOD 1

ASSEMBLE AND INSTALL HYDRAULIC HOSE AND FITTINGS

Learning Task 1:
Describe hydraulic hose and fittings

[Co-ordinate level of detail with Common Core **L-3**, Assemble Pipe, Tubing and Fittings, and **L-4**, Assemble Hose and Fittings]

Describe: hose and hose construction: low, medium, high and very high pressure; types of hose: fabric braid, single wire, double wire, spiral wire; applications, and selection criteria.

Describe: hose fittings: male and female, low, medium and high pressure, thread seal, dry seal, flare seal -J.I.C. and S.A.E. -, O-ring, split flange O-ring, permanent and reusable. **Describe**: types of hydraulic pipe and tubing; criteria for strength and line size.

Describe: pipe and tubing fittings: iron pipe thread, inverted and S.A.E. flare and compression, double compression and solderless compression fittings.

Learning Task 2:
Describe installation procedures for hydraulic hose and fittings

Describe: **Safety** while working on hydraulic systems; removal and installation procedures for low pressure, medium and high pressure hose in a system; common hose failures and causes: hose selection, hose length, rubbing, heat, twisting.

Describe: removal and installation procedures for hydraulic pipe and tubing; pipe and tubing failures and causes. **Illustrate**: correct angle selection for hose installation.

Video: Caterpillar -The XT Connection

Practical Competency:

Assemble hydraulic hose, pipe and tubing and fittings in the shop
Assemble hydraulic hose, pipe and tubing and fittings on live equipment

---

Figure 3 Blueprint document sample

The chart in Figure 4 summarizes the stages in the development process and identifies the responsibilities of the Centre for Curriculum and Professional Development and those of the contractor.

DEVELOPMENT PROCESS SUMMARY	
STEPS	RESPONSIBILITY
DEVELOP COMPETENCY PROFILE	CENTRE FOR CURRICULUM AND PROFESSIONAL DEVELOPMENT IN CONSULTATION WITH CONTENT SPECIALISTS
VALIDATE COMPETENCY PROFILE	CENTRE FOR CURRICULUM AND PROFESSIONAL DEVELOPMENT IN CONSULTATION WITH CONTENT SPECIALISTS
DEVELOP PROGRAM OUTLINE	CENTRE FOR CURRICULUM AND PROFESSIONAL DEVELOPMENT IN CONSULTATION WITH CONTENT SPECIALISTS
ESTABLISH A REVIEW COMMITTEE	CENTRE FOR CURRICULUM AND PROFESSIONAL DEVELOPMENT
DEVELOP BLUEPRINT DOCUMENT	CONTRACTOR/CENTRE FOR CURRICULUM AND PROFESSIONAL DEVELOPMENT/REVIEW COMMITTEE
DEVELOP LEARNING GUIDES	CONTRACTOR
REVIEW LEARNING GUIDES	CENTRE FOR CURRICULUM AND PROFESSIONAL DEVELOPMENT /REVIEW COMMITTEE
REVISE LEARNING GUIDES AND SUBMIT CAMERA-READY COPIES	CONTRACTOR
PRODUCE INSTRUCTOR GUIDE	CONTRACTOR
PUBLISH AND DISTRIBUTE DOCUMENTS	CENTRE FOR CURRICULUM AND PROFESSIONAL DEVELOPMENT
EVALUATE AND REVISE MATERIALS	CENTRE FOR CURRICULUM AND PROFESSIONAL DEVELOPMENT

Figure 4

Writing guidelines

Writing a program in the competency-based format can be a difficult process. Accordingly, these notes and comments are included to assist you, as the writer, so that the material developed will be acceptable and require the minimum of editing.

General suggestions

Always keep in mind that you are writing for students. Therefore, simple and explicit directions are important. Remember, too, that you are writing a program, not a textbook. This means your writing must do more than present facts; it must also instruct. Use examples and descriptions of actual work situations to illustrate the concepts you wish the students to learn. Real life situations will make the learning experiences more relevant for all students, but particularly for those who may not be aware of what the work or workplace is actually like in their chosen occupation.

As you proceed, closely follow the program outline and blueprint to shape the instructional design and organization of the information and procedures presented. Carefully consider the sequence of the information presented in each learning task. Always try to think of ways to maximize the student's understanding. Whenever possible, draw on the the students' previous learning experiences. If, for example, some of the subject matter has been covered earlier at a lower level, point this out to students and suggest that they review these materials before proceeding with the new, more advanced information. You must also continually try to help the students make connections between their own experiences and what you are teaching.

Balance

Be sure you develop an appropriate balance between theory and practice. Constantly question yourself:

- Does the theory provide a basis for practical activities?
- Do the practical projects test the theory adequately?
- Are the practical competencies you have selected essential to the development of the competency?
- Is the theoretical information presented adequate, without being either excessive or incomplete?
- Do the theory and practice, taken together, completely cover the information you wish to present?

Refer to the blueprint and program outline

When you have finished each competency, check to make sure that your conception of the learning tasks and practical competencies still matches the conception in the program outline and blueprint. Review the steps in the practical activities to ensure they are clear and sequenced appropriately. Remember, the learning tasks and practical competencies should enable the students to achieve the objectives in the program outline and blueprint. Upon completion of a line, the student should be able to competently perform the objective stated in the titles of each competency.

Writing style

Your writing style should make for easy reading and comprehension. New material is easier to understand and learn if a single concept is presented in a single sentence. You need to keep sentences and paragraphs relatively short. Long polysyllabic words should be avoided; short, simple words should be used whenever possible.

Writers should observe consistency in format. Decide on a format and keep to it throughout the project. If the directions for one procedure are given in numerical order or point form, you should not change to a paragraph format in subsequent procedures.

Jargon and special vocabulary

Another consideration is the use of terms and concepts that form part of the normal occupational jargon. You, as the subject matter specialist, may use this vocabulary quite naturally, but you need to remember that in all likelihood such words will be unfamiliar to your students. When you want the student to adopt these kinds of terms, you need to ensure they are all clearly explained, either in a section under key terms at the beginning of the learning task, or in the body of your text as they occur. Some technical writers feel that presenting a definition or explanation in both places helps reinforce student comprehension and vocabulary growth.

Graphics

Graphics in the form of line drawings, photographs, charts and graphs play a very important part in the presentation of information and concepts. They help clarify information and provide students with a means to supplement their understanding of the written text. Where possible, insert graphic illustrations that show the items of equipment described or that help clarify the explanation of a concept or process.

Audio-visual resources

High quality audio-visual resources provide yet another excellent means to aid student learning. The use of such materials is strongly encouraged. In your program's blueprint stage of development, appropriate audio-visual resources should be identified. As the writer, you should preview these and others that you and the review committee may have located. You must keep in mind that these resources must be relevant to the materials and ideas being developed. More information on the use of audio-visual materials follows in the section entitled Resources.

Whenever you use graphics, audio-visual or text materials, you must ensure that you are not violating copyright. The whole area of copyright will be investigated later in this guide.

Learning Guide Review Committee

When a number of learning guides have been drafted, they are sent off to be reviewed by the Learning Guide Review Committee. The function of the committee is to examine and evaluate the material in each learning guide at an early stage of development. This process is very constructive and can be of great assistance to the writer. At review committee meetings, members make recommendations regarding areas requiring reworking, suggest resources that may be useful and answer the writer's questions about the quality of work so far produced and the direction to be followed in completing the project.

You should also make use of review committee members outside the scheduled meetings. For example, you should feel free to consult with members by telephone to seek clarification on the depth required to adequately cover the material, or to work out the details of practical activities.

Work with your editor

Editors and instructional designers work with content writers to help shape, organize, write and rewrite materials in preparation for publication. The role of the editor is to assist you, the content expert, in making the writing clear, concise and specific. You need to develop excellent channels of communication with your editor and/or instructional designer and draw on their expertise in writing and presenting ideas.

Diction, spelling and punctuation

In general, diction should conform to trade standards, spelling should conform to the first usage in the Gage Canadian Dictionary (for words not in the Gage, a comprehensive Webster's Dictionary will be the reference) and punctuation should follow The Chicago Manual of Style.

The spelling and punctuation guidelines are quite clear-cut. The whole area of diction is less prescriptive. The following will help to clarify appropriate language usage.

Diction

As was mentioned above, generally, standard rules of diction should be used. However, you should be aware of several important guidelines.

Jargon

Avoid jargon whenever possible. Use the occupational, trade or technical terminology where necessary but do not overload your students with jargon-laden vocabulary. Remember, some students will be coming to the learning materials with very limited, or maybe even no background in the occupation. This is particularly true of students working through introductory level materials.

Be sure to use the correct and/or standard occupational terminology. If you wish to use a word or phrase that may be slang or is commonly used in the trade but is not technically the correct term, give the correct terminology first and then give the commonly used word or phrase. For example, if you wanted to discuss 3/8" twist drills, you would indicate they are commonly called drill bits in the trade.

Trade brand names

Avoid the use of trade brand names or registered trademarks. Use generic descriptions when possible. For example, use the term powder-actuated tool rather than Hilti tool.

Sometimes a particular trade name is used almost universally in the trade. Trade names such as Skilsaw or Varsol tend to be more widely used than their generic terms, portable circular saw and solvent. For trade names such as these, you could put the trade name in parentheses after you have given the generic term or you could add a phrase identifying the commonly used trade name.

There will be times when there is no equivalent generic term. The trade name then becomes the only way to describe the item or tool. In such a case (they are few in number), give the trade name followed by the trademark symbol. For example, "Use a Surform™ plane, commonly called a cheese grater in the trade, to smooth the wood.

Gender-specific language

Avoid gender-specific language such as he, she, businessman, draftsman, workman and housewife by using alternatives such as you, businessperson, draftsperson, worker and homemaker.

Be especially careful when using singular pronouns to refer back to a gender neutral term such as mechanic, secretary, nurse. The temptation is to use "he" with the first occupation and "she" with the second two. It is often better to use a plural form of the neutral term (mechanics, secretaries, nurses) because the plural pronoun "they" is gender neutral.

Adopt a consistent writing voice throughout your project. Address your reader as "you" rather than "the student."

Institution-specific language

Avoid using terms that are institution-specific. This happens when writers use terms that are commonly used in their institutions, instead of more widely used generic terms. For example, "lab demo" may be perfectly acceptable at your training centre but may be irrelevant or carry a different meaning at another centre.

Specific institutional instructions should be included in the institution's student orientation guides - not in the learning guides. For example, the statement, "Do not write in this guide" is inappropriate for students whose institution requires they purchase the materials.

Specific terms (TRAC and Apprenticeship programs)

In order to avoid institution-specific language and to standardize the materials in TRAC and Apprenticeship programs, the following terms are used consistently in all instructional materials. Other instructional programs are adopting or creating similar standardized terms.

Line

The term "line" is used for the general area of competence on the competency profile chart. Individual learning guides are titled with the line name. For example, Line A - Use Safe Work Practices, is the title of the first general area of competence in the TRAC Common Core program.

Competency

Lines are divided into more specific objectives called competencies. For example, one of these competencies found in Line A is "Competency A-1 - Describe applications of the Workers' Compensation Act in the workplace."

Learning task

Competencies are broken down into sub-skills and these are called learning tasks. In Competency A-1 of Line A in TRAC Common Core is "Learning Task 4: State the Workers' Compensation Board Regulations regarding the reporting of accidents."

Self test

After each learning task there is a self test. The self test is a formative evaluation that allows students to test their knowledge of the information in the learning task. Answer sheets are included so the students can check their own answers.

Practical competency

Practical competencies are the hands-on activities to demonstrate the application of the learned skill. For example, in Competency A-5 of Line A in TRAC Common Core, you will find "Practical Competency 1: Extinguish a small Class A, B, or C fire under the supervision of qualified fire department personnel."

Checklist

A practical competency is followed by a checklist containing the items on which the student's practical competency is evaluated. Instructors or other designated personnel evaluate the practical competency in accordance with the checklist.

Written competency

At the end of each competency or in some cases at the end of each line, students are required to write a test on the information found in all the learning tasks. This summative evaluation is called a written competency. Written competencies usually carry a criterion passing grade of 80% and are marked by the institution.

Instructor

The term instructor is used when direct interaction between the student and the instructor (teacher, technician, lab demonstrator, etc.) is needed. It is also used to encourage students to seek assistance if required. For example, "You may wish to check with your instructor before proceeding with this project."

It is often preferable to use a symbol to represent the instructor or other person providing help or information. The use of a symbol enables each institution to use its own terms to describe "expert" or "support" person.

The TRAC and Apprenticeship materials use the symbol shown on your left.

Learning guide

The printed material that guides the student through the learning experiences required for each line of a program is called a learning guide.

Metric and imperial usage

Currently, a combination of metric and imperial measurement is used in most vocational learning materials. However, the standard metric measurement system using SI units is to be used throughout all new learning materials. SI (an abbreviation for Systeme International d'Unites) has been adopted by over 30 countries and is the basis for most measurements world wide.

The required format is to always present the metric measurement followed by the imperial equivalent in parentheses. For example, 34.5 MPa (5000 psi), 1.5 kg (3.3 lb) and 3.66 m (12') all show the format for this double dimensioning.

Exceptions

There are two exceptions to the practice of stating measurement in SI and then listing the imperial equivalent in parentheses.

First, if the metric conversion is "soft", and trade or conventional usage still refers to items in imperial measurement, you can use the common term. For example, a 3/4" electric drill does not have to be referred to as a 19 mm (3/4") electric drill.

Another example of this type of exception is wood plank sizing. You can refer to a wall stud as being a "two by four" without converting the term to metric. However, the length of the stud should be expressed in metric followed by the imperial equivalent in parentheses, for example, 1 piece of 2 x 4 3.66 m (12') long.

The second exception occurs when there are no approved metric equivalents, as in the case of 4" channel iron or a 1/2" socket wrench set. With channel iron, you would call up the width in imperial only, but the length in metric first followed by the imperial in parentheses. With the socket wrench you would designate in imperial only.

Conversions should be rounded off to the most practical figure. For example, to refer to a 2" piece of steel, round off the metric conversion to 50 mm; do not use the true conversion of 50.8 mm unless this degree of accuracy is essential.

One measurement only, metric or imperial, can be used in illustrations provided that it is consistent with the measurement used in the related text.

General rules for stating metric measurements

There are several rules that are used in the metric system.

. a zero (0) must always precede the decimal point if the number is less than 1

  For example, 0.15 m - not .15 m

. all SI units have symbols which are always used when numbers are used

  For example, 10 L or ten litres, but never 10 litres

. the plural "s" is never used with a symbol

  For example, 150 mm - never 150 mms)

- metric symbols are written without a period except when the symbol comes at the end of a sentence

- symbols are written in lower case except when the unit name is derived from a proper name with the exception of litre which abbreviates to L

- a space is always left between the last digit of the number and the first letter of the symbol

  For example, 10 kPa - not 10kPa

- only one unit is used to express a single quantity

  For example, 2.250 m or 2250 mm - not 2 m 250 mm

- decimals, not fractions are used

  For example, 0.75 L - not 3/4 L

- long numbers are written using spaces instead of commas to indicate three digit groups. Spaces also separate three digit groups to the right of the decimal point

  For example, 15 000 km - not 15,000 km; 0.000 250 m - not 0.000250 m

General rules for stating imperial measurements

There are only two general rules used with imperial measurements.

- use the symbol " for inches and ' for feet when numerals are used to express a length

  For example, 6" - not 6 inches or 6 in.

- measurements where both feet and inches are expressed should be written with the two values separated by a dash

  For example, 1'-3/4" and 12'-6" - not 1'3/4" and 12'6"

Glossary of behavioural terms

The title of every learning task, competency and line begins with a behavioural term to indicate the desired learning outcome. Listed below are the most commonly used behavioural verbs in the TRAC and Apprenticeship materials.

Assemble: to bring or fit together

Calculate: to arrive at a precise numerical answer - often through the use of mathematical formulas

Define: to set forth the meaning of a term, or of an expression

Describe: to give the characteristics and/or properties of an object

to give a detailed and/or graphic account of a process or procedure; the use of correct terminology, the sequencing of events, and the interrelationship of the elements are required where necessary

Determine: to arrive at, or to locate, information by a simple process (for example, by rule of thumb)

Identify: to use the correct terminology to describe objects (see definition above), both individually and collectively; to state their application or use, and to point out and name them

Inspect: to look into, or at, carefully; to examine, or observe, critically in order to detect flaws or errors

Interpret: to explain the meaning of; to have and be able to show an understanding of the meaning

List: to give, in point form, several items of information; no sequence or interrelationship is required

Locate:	to seek out and determine the position of
Maintain:	to keep in good condition, to keep functional and in good repair
Overhaul:	to check thoroughly for needed service; to make the repairs, replacements or adjustments needed to restore to good working order
Perform:	to carry out; to do in a formal manner or according to prescribed ritual; to carry out an action or pattern of behaviour
Repair:	to put back into good condition after damage or wear; to mend or fix
Select:	to choose the most appropriate object, process or procedure, given a specific situation; when selecting objects the ability to identify is implicit
Service:	to remove, maintain, repair, or replace items and/or components
Sketch/draw:	to draw simply and quickly, or in outline form
State:	to set out an idea briefly - in one or two phrases or sentences
Test:	to try something against a criterion or standard
Troubleshoot:	to investigate a problem; to look at, critically and methodically, in order to find out the causes, facts or condition
Use:	to put into action or service; to carry out a purpose or action by means of

Verify: to prove to be true by demonstrations or evidence. To test or check the accuracy or correctness of, by investigation, or by comparison to a standard or reference

Copyright

All provincially funded curriculum must be free of copyright violation. The contracting institutions are responsible for any litigation or prosecution that may arise from the printing and distributing of the materials they have created.

Remember, as a writer, you must not use materials from a catalogue, informational brochure, booklet, journal article or textbook without first receiving permission from the publisher and, sometimes, the author.

Seeking copyright permission, however, can be time-consuming and expensive, particularly if you are dealing with large publishing houses for permission to use materials taken from their textbooks. Such publishers tend to be reluctant to allow their work appear in what they sometimes view as a competitor's resource. Often it is less time-consuming and simpler to rewrite the material in your own words, and have the illustrations redrawn in a different way.

A better bet for copyright permission is the equipment and tool manufacturers. User handbooks, sales brochures, and pamphlets published by competing industrial concerns often contain excellent charts, drawings and process/procedural information. These manufacturers will usually give you permission to reproduce parts of their materials if you are willing to insert an acknowledgment in your learning guide. They also often request a copy of the finished work so they can see how you have used their materials.

Original copies of any copyright releases obtained by you must be submitted along with your completed instructional program. These releases should clearly indicate that permission has been granted for the provincial government's agency to publish and distribute the copyrighted extracts contained in the learning materials.

A sample letter requesting copyright permission can be found on pages 21-22. However, the copyright holder may request further information regarding such items as:

- number of copies
- fee for use
- time limitation
- territory
- distribution
- acknowledgments

If such requests or conditions are received, the contracting institution should consult with the curriculum funding agency before complying.

Sample letter requesting copyright clearance

Institutional Letterhead

Date

Salutation

Re: Copyright permission

We are currently preparing learning guides for the Province of British Columbia, Ministry of Advanced Education, Training and Technology. These learning guides are competency-based, self-paced training materials used by our educational institutions.

It is the Ministry's policy to price these resources to recover costs. All recoveries are used for the operation of the distribution centre and the production, revision and development of resources.

We request permission on behalf of the Ministry of Advanced Education, Training and Technology, to use the following copyrighted materials for inclusion in a set of learning materials.

Title _____

Copyright Holder _____

Author/Artist _____

Material to be reprinted _____

Use Self-Instructional learning guide in a program entitled _____

.../2

Sample Letter Requesting Copyright Clearance - continued

If you are willing to grant us permission to copy the materials identified, please sign a copy of this form and return it to me at the address above.

CONSENTED AND AGREED TO:

_____
Signature

_____
Title

_____
Date

Test item construction

An integral part of the development of competency-based learning materials is the creation of test items. There are usually two types of tests in competency-based materials: self tests and written competencies (post tests). The test items for both these tests must come from the contents of the learning guide and should include ideas found in audio-visual presentations if such were used.

Self tests

Self tests are used as formative evaluation to assist students in preparing for writing the written competencies.

Self tests may include the following selection type questions:

. multiple choice
. matching
. true/false

Supply type items, such as fill-in-the-blank, short answer or other subjective type questions, should only be used where it is required to have the student use or express some rule or concept.

The proportion of multiple choice, true/false, matching and short answer questions asked in a self test is similar to the proportions recommended for a written competency which is given below.

Written competencies

Written competencies are used as summative evaluation. The majority of questions asked should be selection type items. Subjective and supply type questions should not be used for these tests because of the problems associated with objectivity and the inability to use machine scoring. However, where it is deemed appropriate and necessary to evaluate certain learned skills (such as in mathematics or the interpretation of regulations), supply type questions may be used.

The vast majority of questions in a written competency (85% to 100%) should be well constructed multiple choice question. Where appropriate, up to 5% of the test items may be true/false questions, 5% may be matching questions and 5% may be short answer questions.

Writing considerations

The following points are listed to provide you with some guidelines for constructing test questions.

Multiple choice items should

. have one correct answer and three distractors

. NOT use "all of the above" or "none of the above" as a distractor

. have options that are all reasonable

. NOT be written to trick or "catch the student out"

. avoid the use of negative words but, where necessary should have the negative word in capital letters (for example, NOT, EXCEPT)

. have numerical distractors in ascending or descending order

Matching items should

. be composed of two clearly headed lists containing homogeneous items

. be short lists of no more than 8 to 10 items with more answer choices than required

. contain clear directions to the students on how the question should be answered

True/false items should

. be limited in use as they are not very effective diagnostically

. only be used when there are only two possible responses

. NOT be used to test trivial knowledge

. only be used when the statement is clearly true or false

. NOT be used to pose questions that require a double negative in order to be answered

Production style for test items

Test items should be consistently presented for both self tests and written competencies using the following styles as a guide.

Multiple choice

1. Fittings for high pressure hoses have notches that indicate

   a. the wrench size needed
   b. which direction to tighten the fitting
   c. the length of the skive
   d. the diameter of the hose to use

2. Which type of saw is used to cut long gradual curves in wood?

   a. coping saw
   b. back saw
   c. key hole saw
   d. rip saw

3. Long, loose loads should be rigged for lifting with

   a. an endless sling
   b. a pair of double wrap basket hitches
   c. a two-legged bridle hitch
   d. a double choker hitch

Matching

1. The following is a list of products and their relative speed of oxidation. From the list in Column B select the speed that best corresponds to the product in Column A.

Column A		Column B
1.	_____ Oily rags	a. not at all
2.	_____ Wood burning	b. very slow
3.	_____ Rusting of iron	c. slow
4.	_____ Gun powder exploding	d. extremely fast

True/false

1. The dimensions on a detailed drawing are the actual size of the object.

   a. true
   b. false

Short answers

1. The presence of dirt and electrolyte on top of a storage battery causes excessive _____.

2. What are the two basic kinds of record-keeping forms used by most companies?

Answer sheet for written competencies

Answer sheets for written competencies should include information identifying the program, the line, and the competency as well as each item number, the correct answer and the learning task from which the item was drawn.

The specific page format for TRAC and Apprenticeship materials is presented in the Appendix located in the back of the Style Guide.

For more information about the generating of test questions, consider consulting either of two books by Norman E. Gronlund. They are:

1. Gronlund, Norman E. Constructing Achievement Tests, 2nd ed. Englewood Cliffs, N.J.: Prentice-Hall, Inc.

2. Gronlund, Norman E. Measurement and Evaluation in Teaching, New York: McMillan Publishing Co. Inc.

3. Meyer, Marian. Test Item Construction: A Self-Instructional Manual, Victoria, B.C. Province of British Columbia, Ministry of Advanced Education and Job Training, 1988.

Instructor guides

The contents of the instructor guide include the information necessary for an instructor to be an effective manager of a competency-based program. This guide contains:

- acknowledgements (writers, editors, review committee)
- information regarding the development of the particular program
- the competency profile and program outline
- relationship to other levels including their competency profiles
- a program map that identifies prerequisites and suggests the preferred sequence(s)
- competency summaries including suggestions for additional or alternative projects, background on the review committee's decisions, and ideas for implementation
- checklists for practical competencies
- lists of print and audio-visual resources
- lists for major equipment and tools
- feedback page(s) for submitting comments and corrections to the Centre for Curriculum and Professional Development

The layout for the instructor guide is not prescriptive; however, the product should be of comparable quality to the learning guides. The Centre for Curriculum and Professional Development will have these guides printed in three-ring binders with covers to match the corresponding learning guides.

Production guidelines

Writers should remain as faithful as possible to the terminology, wording and organization of the program outline in the development of materials. As the writing progresses, however, it sometimes becomes necessary to consolidate learning tasks or to add new items. In such cases, you must notify the provincial curriculum coordinator of your intentions. In addition, your changes must be brought to the attention of the review committee at its next meeting or earlier.

General suggestions

There are several design considerations to keep in mind.

The use of bold face for the purpose of emphasis is acceptable only where absolutely necessary. Bold face does not reproduce well, and its indiscriminate use tends to reduce its impact and, in some cases, can confuse the student.

Italics are used for the titles of publications or audio-visual resources and for other specific treatments as given in The Chicago Manual of Style.

Underlining may be used only as a replacement for italics and in "E" level headings.

Writers should use graphics where their use explains or clarifies the material being presented. Graphics need not be complex; a simple line drawing is often a very direct and informative way to illustrate an idea or principle. Graphics shall be referred to in the body of the text in all cases. Each graphic should be identified by a figure number and should have a caption. An example of an appropriately used graphic is shown in Figure 1.

Figure 10 shows a typical metallic O-ring application. Axial compression is exerted on the metallic O-ring which is placed between parallel faces. The parallel faces are square to the fluid passage. If a retainer is not used, a counterbore or closed groove is machined on one face to locate the O-ring.

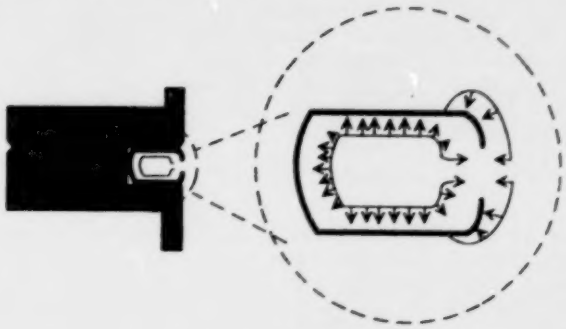


Figure 10 Typical metallic O-ring in static use

Compression results in a slight buckling of the seal tubing. Maximum contact stress between the seal and the mating faces is produced and there are two contact areas on each seal face. The metallic O-ring will form a satisfactory seal even when there is some deviation in the sealed faces.

Figure 1 Typical application of a line drawing

Symbols

Symbols provide visual cues to emphasize an important point, to indicate potential hazards, to reinforce the need to wear protective equipment or to direct students to certain activities. Symbols should be used in moderation as overuse reduces their impact.

A symbol (sometimes called a logo) is inset into the left-hand side of the text in the manner shown in Figure 2 which is a reduced page from a TRAC Common Core Learning Guide.

G-1 LEARNING TASK 2

The carbide tips, which are extremely hard and brittle, are brazed onto a standard-sized metal disc. The carbide tips are then ground to a shape suitable for the blade's intended use. The shape of the tooth illustrated in Figure 8 is known as triple chip and can be used for plastic laminates, hardboard, plywood, aluminum, brass and for cross cutting lumber.

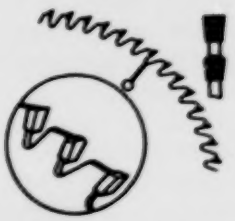


Figure 8 Carbide tipped

Carbide is so hard and brittle that it can be chipped and dulled through contact with other hard materials. As a result, all carbide tipped blades require careful handling. You must not let the carbide come in contact with any hard surface such as the metal parts of a saw, other saw blades, or concrete and masonry.

Figure 2 Placement of symbol

In some situations it is necessary to point out several hazards that may be encountered in a single procedure. You then use the appropriate symbols aligned across the page together with a short note informing the student of the potential hazards. Figure 3 shows the placement of multiple symbols.

Hazards

This practical competency can be hazardous. Ensure that all safety precautions are followed.

Procedure

Contact your instructor who will arrange for you to complete this project and will check your work as you progress

1. Obtain equipment and material.
2. Set up and check the oxyacetylene equipment thoroughly.
3. Check tip for sizing and make sure it is clean.

Figure 3 Placement of multiple symbols

The symbols shown below and on the next page have been developed for the TRAC and Apprenticeship Programs. You may find many of them useful in other materials as well.

Directions

instructor and/or resource person

go to

read

view

attention

proceed to Written Competency

proceed to Practical Competency

Self Test

clean-up

obtain tools and/or equipment

Hazards

fire hazard

explosive hazard

Hazard symbols - continued

corrosive hazard

poison hazard

electrical hazard

caustic hazard

compressed gas hazard

Personal protection

head protection

lung protection

eye protection

hand protection

ear protection

foot protection

Page design and make-up

All institutions under contract to develop and produce educational materials must submit these materials on machine-readable discs as specified by the contract. These materials become the property of the provincial funding agency.

When the contract calls for camera-ready copy, such copy must be completely ready for printing and include headings, paste-up and correct pagination for double-sided printing.

The information below and the sample pages in the Appendix are specifically referenced to the development of all TRAC and Apprenticeship materials. They illustrate such items as:

- bullets
- pitch and type sizes
- margins
- justification
- line spacing
- pagination

Although the information presented here is very prescriptive, it is certainly usable (or adaptable) for other curriculum situations.

The materials are to be set in 10 point Letter Gothic type style with the body of the text in an unjustified (ragged right) format.

Pagination begins on the first competency page of the booklet, with the page number placed lower page centre.

Type styles and point sizes for headers, cutlines and running heads are outlined in the chart in Figure 4.

HEADING USES	TYPEFACES	TYPE SIZE	CAPITALIZATION	POSITION
A MAIN TITLES:				
TITLE PAGE	HELVETICA BOLD	24 pt	ALL UPPER CASE	FLUSH RIGHT
CONTENTS	HELVETICA BOLD	24 pt	INITIAL LETTER	FLUSH RIGHT
COMPETENCY	HELVETICA BOLD	24 pt	INITIAL LETTER	FLUSH RIGHT
B PAGE TITLES:				
REQUIREMENTS	HELVETICA BOLD	18 pt	INITIAL LETTER	CENTRED
SELF TEST	HELVETICA BOLD	18 pt	INITIAL LETTER	CENTRED
ANSWER SHEET	HELVETICA BOLD	18 pt	INITIAL LETTER	CENTRED
LEARNING TASK	HELVETICA BOLD	18 pt	INITIAL LETTERS UP	ALL LINES CENTRED
PRACTICAL COMPETENCY	HELVETICA BOLD	18 pt	TO COLON AND FIRST	ALL LINES CENTRED
CHECKLIST	HELVETICA BOLD	18 pt	WORD AFTER COLON	ALL LINES CENTRED
C MAIN HEADINGS:				
NEW TERMS	HELVETICA BOLD	14 pt	INITIAL WORD ONLY	FLUSH LEFT
ON REQUIREMENTS PAGE	HELVETICA BOLD	14 pt	INITIAL WORD ONLY	FLUSH LEFT
IN BODY OF TEXT	HELVETICA BOLD	14 pt	INITIAL WORD ONLY	FLUSH LEFT
SELF TEST AND PAGE NOS. ON ANSWER SHEET	HELVETICA BOLD	14 pt	SELF TEST ONLY	FLUSH LEFT
D SUB-HEADINGS:				
UNDER C HEADINGS IN BODY OF TEXT	HELVETICA BOLD	12 pt	INITIAL WORD ONLY	FLUSH LEFT
AFTER BULLETS IN B TITLES	HELVETICA BOLD	12 pt	ALL LOWER CASE	CENTRED
E SUB-SUB-HEADINGS:				
UNDER D HEADINGS IN BODY OF TEXT	LETTER GOTHIC BOLD UNDERLINED	10 pt	INITIAL WORD ONLY	FLUSH LEFT
F LABELS:				
WITH ILLUSTRATIONS	LETTER GOTHIC OR HELVETICA	LESS THAN 10 PT	INITIAL WORD ONLY	AS APPROPRIATE
G FIGURES:				
NUMBERING AND CAPTIONS	LETTER GOTHIC BOLD AND REGULAR	10 pt	FIGURE AND INITIAL WORD OF CAPTION	AS APPROPRIATE
H RUNNING HEADS:				
LEARNING TASK, PRACTICAL COMPETENCY AND ANSWER SHEET PAGES	LETTER GOTHIC REGULAR	10 pt	ALL UPPER CASE	RECTO - TOP RIGHT VERSO - TOP LEFT
I BODY TEXT:	LETTER GOTHIC REGULAR	10 pt	———	———

Figure 4

Graphics and photographs

As mentioned previously, illustrative materials are an important component of the learning guides. You should be aware, however, that copyright legislation also applies to these materials.

Line drawings, including dot patterns, reproduce well. Original drawings, photo-mechanical transfers (PMTs) or high quality photocopies may be used as the camera-ready copy.

Photographs may be used where appropriate providing that they have good contrast, sharp images, no shadows and clean backgrounds. Affix screened PMTs of photographs to the camera-ready copy. These PMTs should be sized and cropped as required.

Camera-ready copy

Camera-ready copy is the final copy of the text which is ready to be reproduced without further alteration. The camera-ready copy will have the following features:

. headings and graphics firmly held in place by a fixative such as wax

. transparent tape and white-out used sparingly (the copy should be clean of corrections)

. original is on 8 1/2" x 11" (216 mm x 280 mm) clean white paper

Resources

Print resources

The main print resource is the learning guides themselves. In most instances, the learning guides will contain your original text. In some cases, the guides will have information that augments your writing taken from sources whose copyright holders have granted you or your institution the right to reprint. In yet other cases, the learning guides will refer the student to reading material in separate textbooks or in other learning guides.

Reference to textbook sources should be made with caution as textbooks are revised fairly frequently. You must be sure that the texts and other resources you use are the most recent editions available. Where possible, you should check with the publishers to ensure that new editions are not about to be released or that titles will not soon be out of print.

When you refer students to a section in a print resource, list the important things they should be looking for and noting. Depending on the material, you may have to help the students focus their reading by identifying important words, concepts and processes they may encounter. Be sure to bring to the students' attention any inaccuracies or variations that may arise from the resource having been published outside Canada.

References to those sections that you require students to read in print resources are made at the appropriate place in the learning guide and are brought to the attention of students by the use of the "Read" symbol as shown here on your left.

You should not reference a text unless a substantial portion is used. If less than 25% of the book is to be used, you should either apply for copyright clearance to reprint the information or you should write your own material.

In those cases where you do use an outside text, you need to provide full bibliographic information on the Requirements page of the student learning guide, and in the instructor guide.

Audio-visual resources

As noted earlier, the use of audio-visual resources is recommended. Determining the need for and identifying appropriate audio-visual resources should be done at an early stage, preferably during the blueprint process.

Various sources can be searched to identify possible audio-visual resources:

- PEMC catalogues
- producers' catalogues
- bibliographies
- periodicals
- Media Exchange Cooperative (MEC) Catalogue

Resources should be reviewed and evaluated for technical quality, currency, instructional design, appropriate content, interest level, factuality, availability, ease-of-use and cost.

Formats

The preferred format for audio-visual materials is video or 16 mm film, as these can be handled through the Provincial Educational Media Centre (PEMC). Video cassettes are particularly easy to use and have the advantage of being able to withstand repeated use better than other media formats.

Small format media such as slide/tape, filmstrip program or other programs are best avoided as they are not handled by PEMC unless the producer has converted them to video. Such materials would have to be bought by individual institutions that wanted to use the instructional programs.

Self-produced media

Where there is a lack of high quality commercially produced audio-visual resources, you should consider producing original audio-visual resources such as videotapes or photographic flip boards, for example. You may be able to target part of your development funds, or, if additional funds are required, you should carefully analyze the need for the audio-visual materials and then prepare a separate proposal for their production.

Integration of audio-visual resources

Audio-visual materials are identified at the beginning of a learning guide on the Requirements page or its equivalent. The title of the resource and its PEMC number, if applicable, go under the heading "Resources" in TRAC and Apprenticeship materials.

In the body of the text, most often at the beginning or end of a learning task, you direct the student to view the resource. The view logo is shown here on your left.

You should integrate the ideas in the visual resource with the text material in the learning task by listing the major concepts, procedures or processes for the student. This will help focus the student's attention. In addition, bring to the student's attention any inaccuracies or variations between the video and the written materials. There are often a number of such discrepancies when the visual material has been produced outside Canada.

All audio-visual resources are to be listed in the instructor guide giving titles and order numbers for PEMC resources and full bibliographic details for all other resources including format, title, series, date, producer or distributor, address and price.

PEMC procedures

In projects for which PEMC has been funded to provide film and videotape resources, the following procedures should be followed. Writers are encouraged to consult the PEMC post-secondary media coordinator early in the projects and to exchange information on a regular basis throughout the program development.

Evaluate existing PEMC resources

1. Consult the current PEMC post-secondary catalogue and supplements which are usually available from your library or from the post-secondary media coordinator. Copies of resources for evaluation may already be available at your institution or can be borrowed from PEMC.

2. Return completed PEMC evaluation forms to the media coordinator making sure to cite the program, line and competency in which each PEMC resource will appear.

3. Make note of PEMC titles and order numbers from the PEMC catalogue or obtain from the media coordinator in the case of new titles. These will be cited in the instructor guide. The VU and VH suffixes which refer to video formats can be omitted from order numbers.

Evaluate other resources

1. The post-secondary media coordinator will research other 16 mm films or videotapes which may be appropriate for the program. The coordinator will order these for preview, send them to writers for evaluation and consideration for purchase of provincial rights by PEMC.

2. Writers should also suggest to the coordinator any 16 mm film or videotapes which they have located and wish to evaluate for possible provincial rights clearance by PEMC. Resources which receive positive evaluation by the writers may be sent to one or two other institutions for review.

3. Videotape duplication rights for recommended resources are then negotiated by PEMC for distribution to qualifying institutions in B.C. only. If negotiation is successful, the media coordinator will notify the writer of the correct title and order number for inclusion in the student learning guides and the instructor guides. If provincial rights are unavailable, or if the price is too high, the coordinator will inform the writer and assist in searching for a substitute.

4. Since duplication rights usually cost, at a minimum, three times the price of a single print plus the cost of the master, it is not economically feasible to negotiate titles which will be used for a program offered at less than three of four institutions. Such titles are given a lower priority but may be bought if year-end funds allow, especially if they are good programming and can also support other areas.

Providing listing of resources

A complete list of all audio-visual resources is to be provided in the instructor guide. Verify details for PEMC resources with the coordinator and provide him or her with the completed listing.

Additional resources

The following resources are suggested for further reading or reference:

Blank, William E. Handbook for Developing Competency-Based Training Programs. Englewood Cliffs, N.J.: Prentice-Hall, 1982.

Canadian Booksellers Association, Canadian Book Publishers' Council, and Association of Canadian Publishers. Copyright Compliance: A Handbook on Reproduction of Copyright Material by Libraries, Printshops and Educational Institutions. N.p.: Canadian Booksellers Association, Canadian Book Publishers' Council, and Association of Canadian Publishers, 1986.

The Chicago Manual of Style, 13th ed. Chicago: University of Chicago Press, 1982.

Copyright in the School System, Direction de la coordination des réseaux, Quebec, 1986.

Council of Ministers of Education, Canada. The Metric Guide. Toronto: Ontario Institute of Studies in Education, 1976.

Gage Canadian Dictionary. Dictionary of Canadian English Series. Toronto: Gage Education Publishing, 1983.

McGraw Hill Book Company Guidelines for Bias-Free Publishing. N.p.: McGraw-Hill, [1985].

Meyer, Marian. Test Item Construction: A Self-Instructional Manual, Victoria, B.C. Province of British Columbia, Ministry of Advanced Education and Job Training, 1988.

Russell, Dale, and John Collins. TRAC Evaluation Phase I. Victoria, B.C.: Ministry of Education, 1985.

Ward, Christine. Preparing and Using Objective Questions. Handbooks for Further Education. Cheltenham, Glos.: Stanley Thorne Publishers, 1981.

Appendix

Specifications for the Preparation of TRAC and Apprenticeship Program Materials

TRAC program A-2

Samples

1. Cover A-4
2. Title page A-6
3. Cataloguing page A-8
4. Contents A-10
5. Competency A-12
6. Requirements A-14
7. Learning Task A-16
8. Self Test A-18
9. Answer Sheet A-20
10. Practical Competency A-22
11. Checklist A-24
12. Symbols A-26
13. Illustration A-28
14. Photograph A-30
15. Written Competency and Answer Sheet A-32

TRAC program

TRAC (Training Access), which was introduced in 1983, is a provincial system of competency-based education for pre-apprenticeship trades programs. Competencies, Learning Tasks and Practical Competencies are identified for each program. Learning Guides, Written Competencies and Instructor Guides are then developed. At this time TRAC is comprised of a Common Core, eight Occupational Cores and twenty-six Specialties. The correct titles for the Occupational Cores and Specialties are listed in Figure 1 on page A-3.

Common core

The term "Common Core" is used as the title for the first level of TRAC.

Occupational core

The term "Occupational Core" is used, together with the appropriate descriptors, to form the titles of the various family groupings for the second level of TRAC.

Specialty

The term "Specialty" is used, together with the appropriate descriptors, to form the titles of the individual specialty courses for the third level of TRAC.

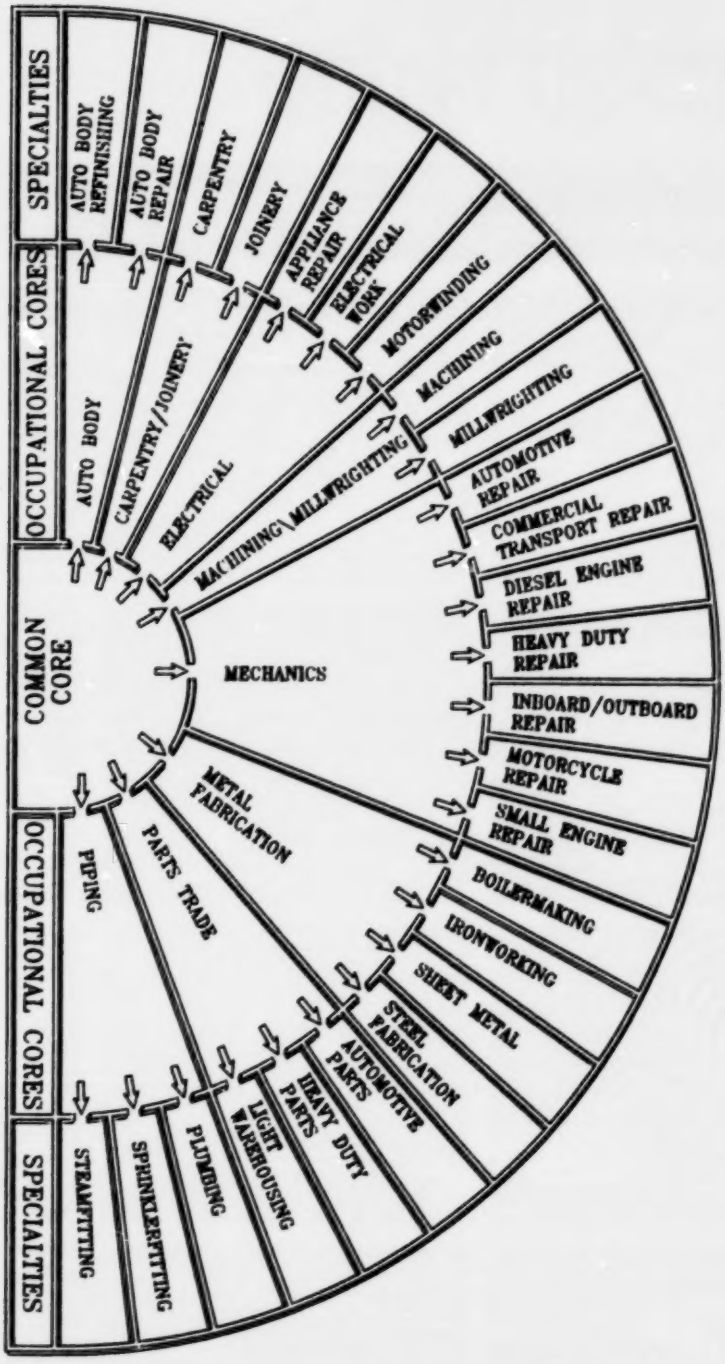

SPECIALTIES
AUTO BODY REFINISHING
AUTO BODY REPAIR
CARPENTRY
JOINERY
APPLIANCE REPAIR
ELECTRICAL WORK
MOTORWINDING
MACHINING
MILLWRIGHTING
AUTOMOTIVE REPAIR
COMMERCIAL TRANSPORT REPAIR
DIESEL ENGINE REPAIR
HEAVY DUTY REPAIR
INBOARD/OUTBOARD REPAIR
MOTORCYCLE REPAIR
SMALL ENGINE REPAIR
BOILERMAKING
IRONWORKING
SHEET METAL
STEEL FABRICATION
AUTOMOTIVE PARTS
HEAVY DUTY PARTS
LIGHT WAREHOUSING
PLUMBING
SPRINKLERFITTING
STEAMFITTING
SPECIALTIES
OCCUPATIONAL CORES
PIPING
PARTS TRADE
METAL FABRICATION
COMMON CORE
MECHANICS
MACHINING\MILLWRIGHTING
ELECTRICAL
CARPENTRY/JOINERY
AUTO BODY
OCCUPATIONAL CORES

Figure 1

Sample Number 1: Cover

Specifications

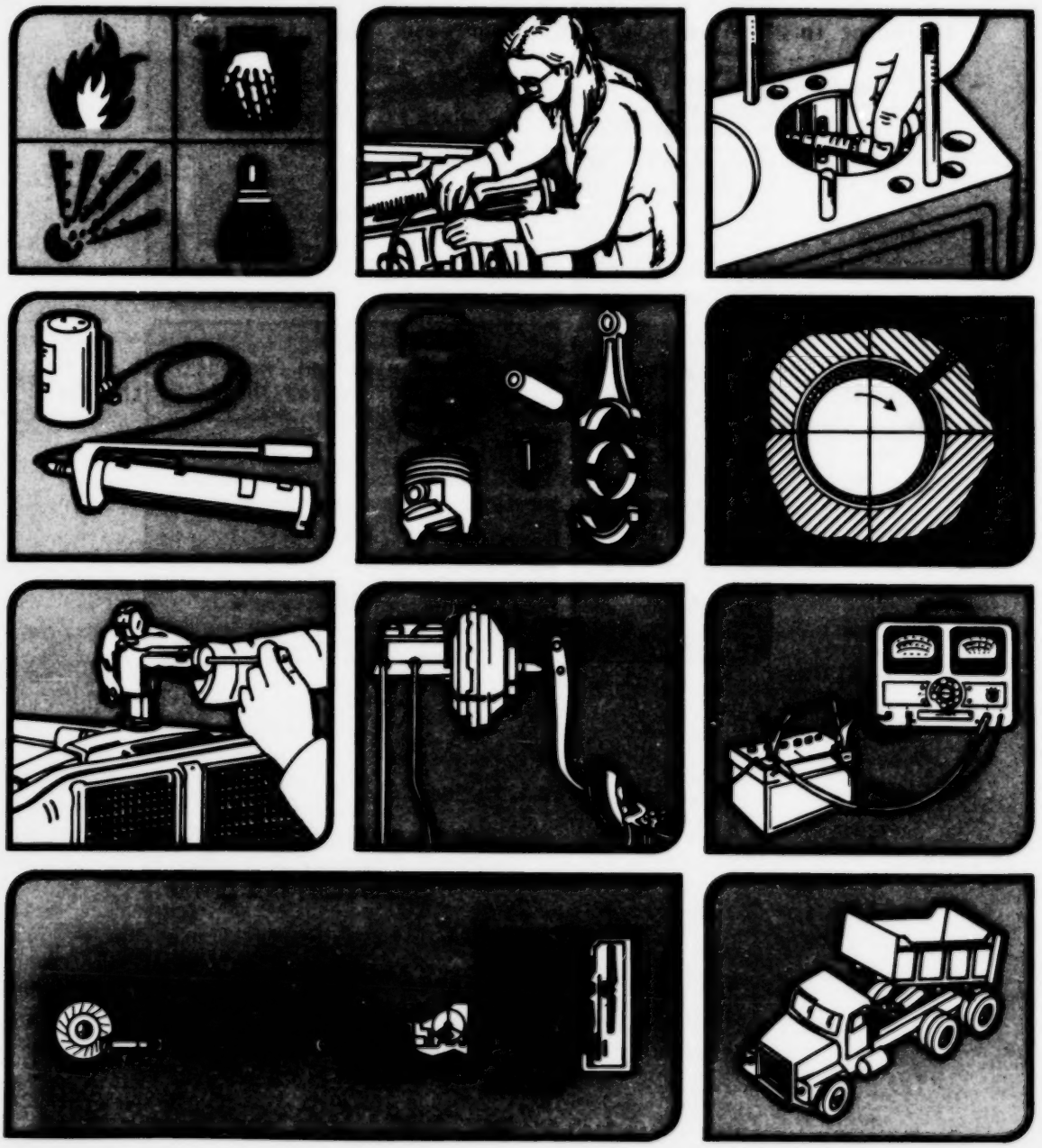
- includes learning guide designation and title, and TRAC program
- includes one illustration for each line in the program
- specific illustration relating to the line is identified with a solid colour

Notes

Cover design and preparation of artwork is handled by the Centre for Curriculum and Professional Development. Contractors may be required to provide suggestions for illustrations and/or assistance to a graphic artist.

LEARNING GUIDE LINE F
IDENTIFY LUBRICANTS

TRAC MECHANICS OCCUPATIONAL CORE



Sample Number 2: Title page

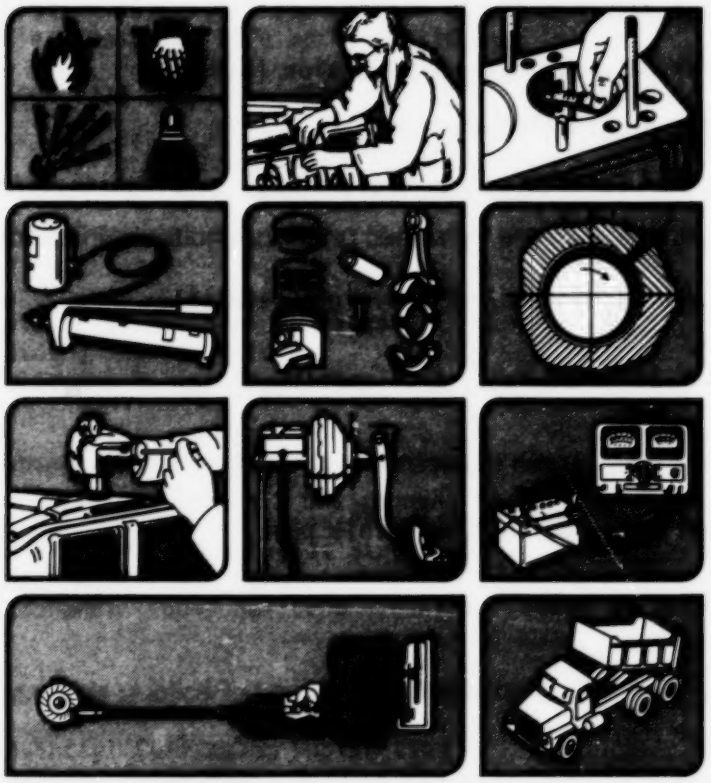
Specifications

- cover illustration with screen reduced 50%
- title set in 24 point Helvetica, upper case, right justified
- includes Province, Ministry, and date

Notes

This page is created by the Centre for Curriculum and Professional Development. Contractors should supply a wordprocessed draft of the text following the standard layout.

LEARNING GUIDE LINE F
IDENTIFY LUBRICANTS
TRAC MECHANICS
OCCUPATIONAL CORE



Province of British Columbia
Ministry of Advanced Education,
Training and Technology
1989

Sample Number 3: Cataloguing page

Specifications

- verso of title page
- includes Canadian Cataloguing In Publication (CIP)
- includes Ministry program information
- includes Centre for Curriculum and Professional Development information
- includes ordering information
- may include acknowledgement(s) of copyright permission

Notes

As this information is subject to change, and CIP must be added, contractors are not required to submit this page.

Canadian Cataloguing in Publication Data
Main entry under title:
TRAC carpentry/joinery occupational core: learning guide

Contents: line A. Describe safe work practices
ISBN 0-7718-8874-0 (set). -- ISBN 0-7718-8875-9 (line A)

1. Carpentry. 2. Joinery. I. British Columbia. Ministry of Advanced Education and Job Training, and Ministry Responsible for Science and Technology. II. Title: Describe safe work practices.

TH5604.T726 1989 694 C89-092251-9

For further information regarding carpentry programs contact:

Coordinator, Construction Programs
Ministry of Advanced Education,
Training and Technology
Parliament Buildings, Victoria, British Columbia V8V 1X4

For further information regarding curriculum development contact:

Centre for Curriculum and Professional Development
Fifth Floor, 1483 Douglas Street
Victoria, British Columbia V8W 3K4
Telephone: (604) 387-6065 Fax: (604) 387-9142

Copies of this publication can be ordered from:

Provincial Curriculum Publications
Marketing Department, Open Learning Agency
P.O. Box 94,000, Richmond, British Columbia V6Y 2A2
Telephone: (604) 660-2190 Fax: (604) 660-2272
Order Number: MN0267

Copyright 1989, Province of British Columbia, Ministry of Advanced Education, Training and Technology

Sample Number 4: Contents

Specifications

- list competencies giving codes, titles and page numbers
- Contents heading to be set in Helvetica, 24 point - bold (A heading)
- suggested margin widths are left 2", right 1".

Contents

H-1 1
SELECT BELTS AND HOSES

H-2 27
SELECT FILTERS

H-3 59
SELECT BEARINGS

H-4 85
SELECT BATTERIES

H-5 151
SELECT SEALS AND GASKETS

H-6 211
DESCRIBE MECHANICS HAND AND AIR TOOLS

Sample Number 5: Competency

Specifications

- begins on recto page
- indent self test and checklist
- omit checklist titles
- number checklists to correspond to practical competencies
- if possible use 1 1/2 spaces between learning task and self test, and practical competency and checklist
- competency title to be set in Helvetica, 24 point - bold (A heading)
- includes a coarse screen vertical strip on the right edge; top, side and bottom margins are approximately 3/8"

Competency F-3
Use Basic Measuring Devices

Requirements 78

Learning Tasks

Learning Task 1: Summarize safe procedures for using electrical measuring instruments 79

Self Test 1 82

Answer Sheet 83

Practical Competencies

Practical Competency 1: Use a megger to measure insulation resistance 84

Checklist 1 87

Practical Competency 2: Use basic measuring instruments for de-energized circuits 88

Checklist 2 92

Practical Competency 3: Use basic measuring instruments for energized circuits 93

Checklist 3 98

Sample Number 6: Requirements

Specifications

- no end-of-line punctuation after bullets
- double-spacing between bullets if possible; single spacing acceptable to keep the requirements to one page
- for competencies with no resources, keep the heading and insert a statement to that effect
- for print resources include the title, author and date
- for audio-visual resources include the title only; omit PEMC numbers
- multiple titles can be stacked with no bullets
- requirements title to be set in Helvetica, 18 point - bold (B heading)
- goals, competencies and resources headings to be set in Helvetica, 14 point - bold (C heading)
- suggested margins: left and right 1" with 1/4" gutters
  top 1" and page number to be approximately 3/4" from the bottom of the page

Requirements

Goals

So far your information about hydraulic systems has pointed out their obvious advantages for transmitting power. It has also made clear that hydraulic systems are vulnerable. For one thing, the components in hydraulic systems are all connected by a common element— the fluid. So, contamination in one part of a system seldom remains isolated, but spreads easily to all other areas. Hydraulic systems are also vulnerable because of the pressure they operate at and the fine tolerances of their components. If those tolerances fail, the system leaks, pressure is lost, dirt and air can get in, and deterioration can be widespread and costly.

Regular and thorough inspection and maintenance is the only way to combat these potential problems. If basic observations are made regularly, and preventive steps taken as they are needed, then most hydraulic systems will continue to operate efficiently for a long time.

When you have completed this competency, you should be able to

- describe precautions to take to work safely on a hydraulic system
- describe inspection procedures for hydraulic systems
- describe procedures for draining, cleaning, flushing, refilling, and bleeding hydraulic systems, and for installing new filters
- perform basic preventive maintenance checks, and tasks

Competencies

WRITTEN: "Perform preventive maintenance on basic hydraulic systems"

You will be tested on your knowledge of safety, inspection procedures and basic maintenance of hydraulic systems

You must achieve 80% on this Written Competency.

PRACTICAL: You will be required to perform a complete hydraulic system inspection, and preventive maintenance tasks such as removing and cleaning screens, installing new filters, draining the system, adding new fluid and bleeding the air.

You must achieve 80% on this Practical Competency

Resources

You will need to refer to the following resource:

VIDEOTAPE: PM of Hydraulic Systems

Sample Number 7: Learning Task

Specifications

- the first learning task in each competency should be placed on a recto page
- include new terms with definitions if applicable
- use running heads giving the competency code and the learning task number. Place running heads in the top left or right corners as appropriate.
- learning task titles to be set in Helvetica, 18 point - bold (B heading). If bullets appear under learning task titles they are to be set in Helvetica, 12 point - bold (D heading).
- main headings within learning tasks to be set in Helvetica, 14 point - bold (C heading)
- sub-headings within learning tasks to be set in Helvetica, 12 point - bold (D heading)
- sub-sub-headings within learning tasks to be wordprocessed in Letter Gothic - bolded and underlined (E heading)
- suggested margins: left and right 1" with 1/4" gutters
  top 1", page number to be approximately 3/4" up from the bottom of the page

Learning Task 1: Identify basic measuring and layout tools

New Terms

Layout: the measuring and then the marking or scribing of lines on the materials out of which you are going to build something. Since these lines are taken from plans or drawings, layout involves the skill of transferring measurements or dimensions accurately and clearly.

Scribing: scoring or marking a line on a hard or semi-hard surface with a sharp instrument

Systems of Measurement

The construction industry in Canada uses two systems of measurements: imperial and metric.

Imperial

In construction the longest unit of imperial measure is the yard. Yards are divided into three equal parts called feet. Feet are divided into twelve equal parts called inches.

1 yard = 3 feet
1 foot = 12 inches
1 yard = 36 inches

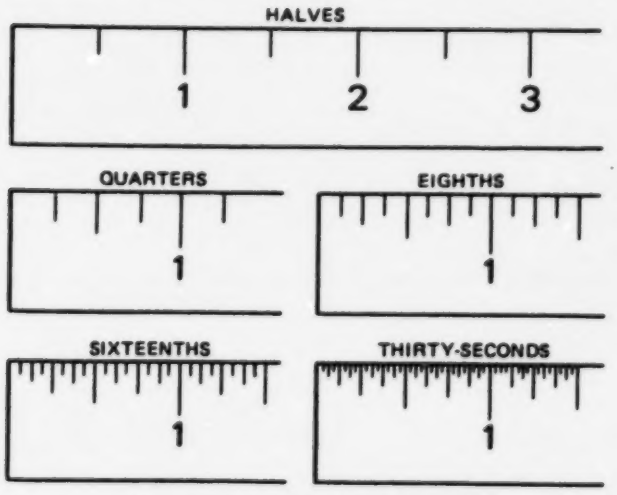


Figure 1 Inch division

Inches are divided into equal parts as illustrated in Figure 1. Fractions used in construction can be as large as 1/2"; but for greater precision, quarters, eighths, sixteenths and so on are used. Most measuring operations in construction do not require accuracy beyond thirty-seconds of an inch.

Sample Number 8: Self Test

Specifications

- use running heads

- at the end of the self test, refer to the page number for the answers, and to written and/or practical competencies as required

- self test title to be set in Helvetica, 18 point - bold (B heading)

- suggested margins: left and right 1" with 1/4" gutters
  top 1", page number to be approximately 3/4" up from the bottom of the page

Self Test 3

1. Using Figure 1, identify the components of a basic circulating hydraulic system.

   a. relief valve ___
   b. pump ___
   c. control valve ___
   d. cylinder ___
   e. reservoir ___

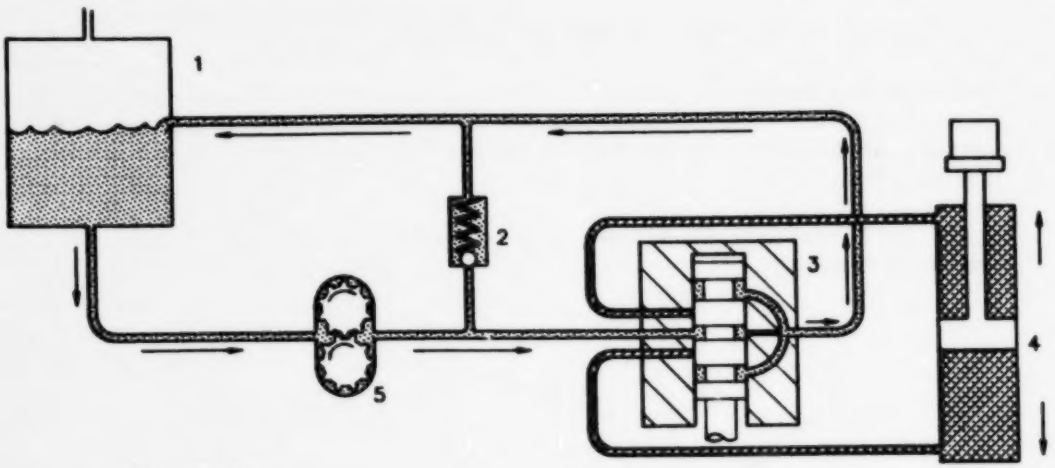


Figure 1

2. The component that converts hydraulic flow and pressure into mechanical force is the

   a. pump
   b. reservoir
   c. cylinder
   d. control valve

3. The component that is driven by mechanical force to create hydraulic flow is the

   a. pump
   b. relief valve
   c. cylinder
   d. control valve

4. List four functions performed by the hydraulic system reservoir.

Sample Number 9: Answer Sheet

Specifications

- place at end of each competency section and prior to any practical competencies
- align periods after question numbers
- use periods after letters for the answers
- use running heads
- answer sheet title to be set in Helvetica, 18 point - bold (B heading)
- self test headings on answer sheet to be set in Helvetica, 14 point - bold (C heading)

Answer Sheet

Self Test 1 — pages 11-12

1. a. north to south
2. b. away from the held magnet
3. d. iron, cobalt and nickel
4. c. an excellent temporary magnet
5. a. two poles
6. d. permanent magnet
7. a. temporary magnet
8. b. easy to magnetize
9. c. easy to demagnetize
10. c. screening

Self Test 2 — pages 19-20

1. a. thumb
2. b. fingers
3. b. going into the page
4. a. attracted to one another
5. b. repelled from one another
6. c. increases
7. d.

8. a. yes

Sample Number 10: Practical Competency

Specifications

- use running heads
- practical competency title to be set in Helvetica, 18 point - bold (B heading)
- main headings within practical competencies to be set in Helvetica, 14 point - bold (C heading)
- sub-headings within practical competencies are to be set in Helvetica, 12 point - bold (D heading)

Practical Competency 4: Grind rough pipe and square

You will be required to use an angle grinder to grind a rough cut, over length pipe to a finished length of 152 mm (6"). The ends of the pipe must be ground square and perpendicular to the length of the pipe.

After you have been evaluated, you will be required to clean your work area and return all equipment.

Your instructor will evaluate your performance on the basis of the checklist of page 63.

Equipment

- angle grinder
- vise
- wrap-around
- square
- measuring tape

Materials

- rough cut 2" pipe 159 mm (6 1/4") long

Procedures

Contact your instructor who will arrange for you to complete this project and check your work as you progress.

1. Mark pipe for finished length of 152 mm (6"), using wrap-around. If you are unsure how to use the wrap-around, see your instructor.

2. Secure pipe in vise.

3. Grind ends to marks, square and perpendicular to the length of the pipe.

4. After you are evaluated, clean your work area.

Sample Number 11: Checklist

Specifications

- follows appropriate practical competency
- use standardized box for all checklist pages
- checklist title is the same as the title for the practical competency
- if contents do not fit in the box, adjust line spacing or move 2 to 3+ lines to the next page
- locate total at the bottom of the box
- identify items requiring 100% accuracy with an asterisk (*)
- identify points for other items that may be weighted by the writer
- use running heads
- checklist title to be set in Helvetica, 18 point - bold (B heading)

Checklist: Grind rough pipe and square

Student's Name _____ Date _____

Student's I.D. #_____ Attempt 1 2 3 4

Each item is worth five points.

Mark: _____ Minimum: 28 Maximum: 35

Items to be Evaluated	Points
1. Wrap-around was used properly to mark finished length of pipe.	
2. Angle grinder was used correctly to grind pipe ends square.	
3. Finished project matches Project Diagram specifications.	
* 4. Observed all safety procedures.	
* 5. Followed correct operating procedures.	
* 6. Cleaned work area to shop standards.	
* 7. Stored equipment properly.	
Total	

* These items must be completed with 100% accuracy.

Comments: _____

_____

Instructor's Signature _____

Sample Number 12: Symbols

Specifications

- symbols to be tabbed 10 spaces in from the left margin
- each symbol requires at least four lines, plus one line above and below to set it apart from the regular text
- when several symbols are used to indicate multiple hazards, the symbols are aligned horizontally

Notes

- use standard symbols as listed on pages 31 to 32

Freon gas

Handling

Freon gas is used as a refrigerant in air-conditioning or refrigeration units. In spite of the fact that it is colourless, non-explosive and nonflammable, it is one of the most volatile and dangerous substances you will come in contact with. You must handle it with extreme care and follow these precautions.

1. Keep storage or service area well ventilated. At atmospheric pressure and room temperature freon is heavier than air. If discharged into a poorly ventilated room, it will displace the air and can cause suffocation. Ample ventilation also helps to prevent poisoning from breathing the fumes formed when freon comes in contact with an open flame.

2. Always wear protective goggles when you are working on or near an air conditioning system. Freon vaporizes so quickly it will freeze anything it contacts. If it contacts your eyes, serious damage may occur.

3. Keep sterile mineral oil and a weak boric acid solution on hand. If, by some chance, freon enters your eyes, do not panic! Splash large amounts of cold water into your eyes as a means of raising the temperature. Do not rub your eyes. Apply several drops of sterile (clean) mineral oil to your eyes. The oil will absorb the freon and help flush it from the eyes. Follow this with a liberal application of boric acid solution. Always seek the services of a doctor at once - even if the pain seems to have disappeared.

4. Keep freon away from skin. If freon contacts your skin, treat in the manner recommended for the eyes.

Storage

Freon is stored under pressure in drums or small cans, or in air-conditioning and refrigeration units themselves. Heat is a real source of danger for freon under pressure. Even the direct rays of the sun can raise the pressure sufficiently high to burst a refrigeration system, or to blow out the safety plug cans are equipped with. Keep containers of freon well away from any source of excessive heat including direct sunlight.

In addition, be sure the protective screw cap is in place over the valve to prevent damage to the valve unit.

Sample Number 13: Illustration

Specifications

- Figure # is bold with no period
- include cut lines where appropriate
- number figure sequence within Learning Tasks

2. Remove caps covering cylinder valves (Figure 2) once cylinders are secured. The caps match the size of the cylinders and usually, the color. Oxygen cylinder caps may be black or green and acetylene caps are red. Cylinder caps should always be in place when transporting cylinders, or when cylinders are not in use.

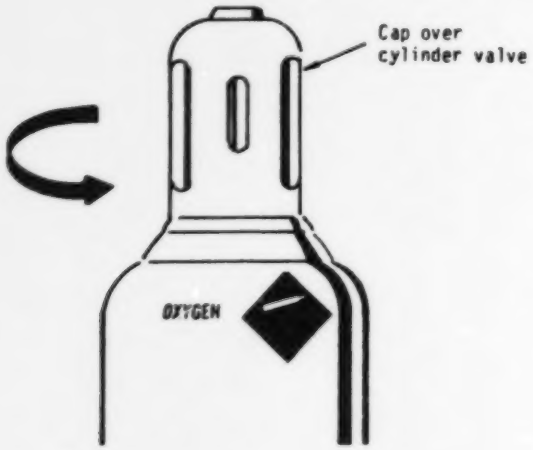


Figure 2 Remove cylinder caps by turning counterclockwise

3. Before attaching regulators, "crack" oxygen and acetylene valves by slightly opening, then quickly closing, the valves (Figure 3). This clears any dust or foreign particles from the valve outlets. Stand to the side of the valve outlets: make sure they are not pointed toward yourself or anyone else. Any particles inside the valves come out with such force, they become "bullets".

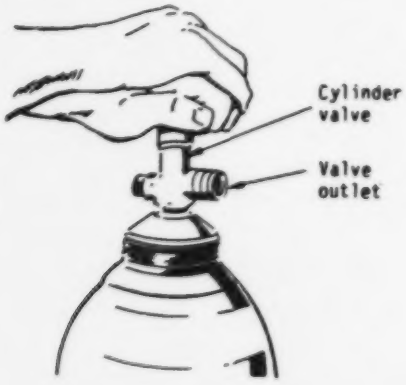


Figure 3 "Crack" valves to clear out any dirt particles: stand to side of valve outlet

Sample Number 14: Photograph

Specifications

- affix screened PMTs of photocopies which have been sized and cropped as required

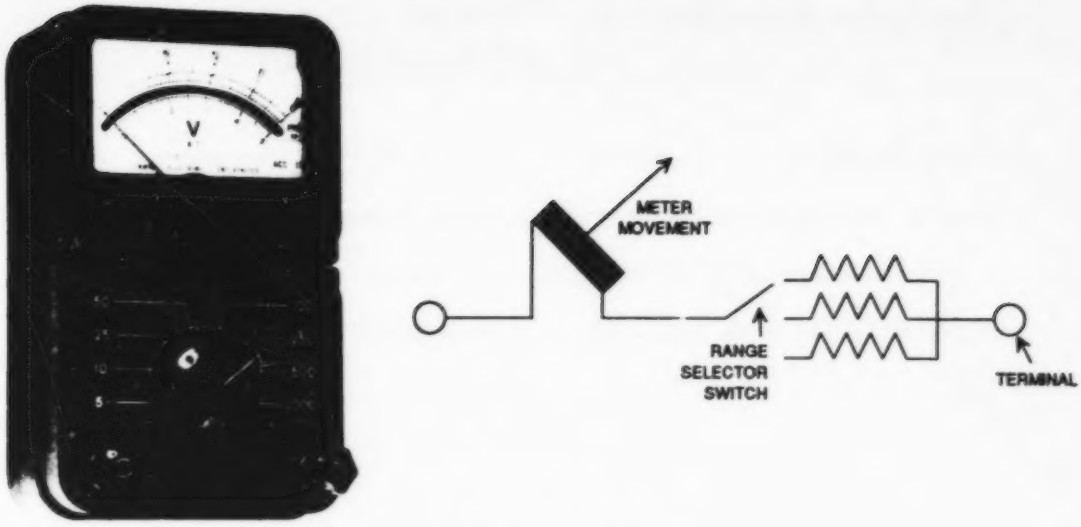


Figure 10 Multirange voltmeter

The multirange ohmmeter can be created in two ways. First, the ohmmeter may contain two batteries of different voltages. A selector switch is used to determine which emf will be used. When the emf changes, the current level will also change and the pointer will be affected.

The second way to create a multirange ohmmeter (Figure 11) is to include several shunt resistors. These shunts are connected in parallel to the usual fixed resistor and variable resistor. You use a rotary selector switch to choose the range of the meter. You determine the actual resistance of the component being checked by multiplying the value indicated by the pointer and the chosen resistance value.

Figure 11 Multirange ohmmeter

Sample Number 15: Written Competency and Answer Sheet

Specifications

- date each page of the written competency and the answer sheet
- written competency title to be the same as the competency title
- identify learning tasks for each answer on the answer sheet

CARPENTRY/JOINERY OCCUPATIONAL CORE - WRITTEN COMPETENCY I-1

Describe platform frame construction

Choose the best answer for the following questions.

1. You may have trouble hiding the electrical wires and plumbing pipes if you build a home using

   a. balloon framing
   b. post and beam framing
   c. platform framing

2. Balloon framing requires the studs to run from

   a. concrete to roofing
   b. floor sheathing to top plate
   c. sill plate to rafter plate
   d. one floor to the next

3. You would sheath the walls before standing them up if the framing method is

   a. post and beam
   b. platform
   c. balloon

4. You may have to install the insulation above the roof sheathing if the framing method is

   a. balloon
   b. post and beam
   c. platform

5. Embedding the ends of the floor joists in the concrete foundation eliminates the need for

   a. additional anchoring
   b. blocking
   c. cross-bridging
   d. header joists

ANSWER SHEET

Carpentry/Joinery Occupational Core - Written Competency I-1

1. B - Learning task 1
2. C - Learning task 1
3. B - Learning task 1
4. B - Learning task 1
5. A - Learning task 2
6. B - Learning task 2
7. D - Learning task 3
8. C - Learning task 3
9. D - Learning task 3
10. C - Learning task 3
11. C - Learning task 4
12. D - Learning task 4
13. D - Learning task 4
14. D - Learning task 4
15. A - Learning task 2
16. C - Learning task 4
17. D - Learning task 4
18. A - learning task 1
19. C - Learning task 3
20. B - Learning task 3